

# Distribution Network Planning & Inventory Optimization Supported by Simulation



Andrey A. Malykhanov,  
Amalgama, LLC



Ulyanovsk, Russia  
[www.am-sim.com](http://www.am-sim.com)

Amalgama

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## Presentation summary

Why this case study?

Project background &  
modeling task definition

Modeling replenishment in  
supply chain

(Big) data issue at  
validation and scenario  
analysis

Model video

Modeling results / value  
for the client

# Why this case study?

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1. Share our experience in real supply chain simulation modeling
2. Combination of AnyLogic model and advanced data analysis technologies
3. Give an example of real value brought to the client by simulation

# Project background

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## **Background:**

- Diageo Russia – one of Russian top-5 wholesale alcohol beverages distributors
- Low-margin business very sensitive to customer service level and logistic costs

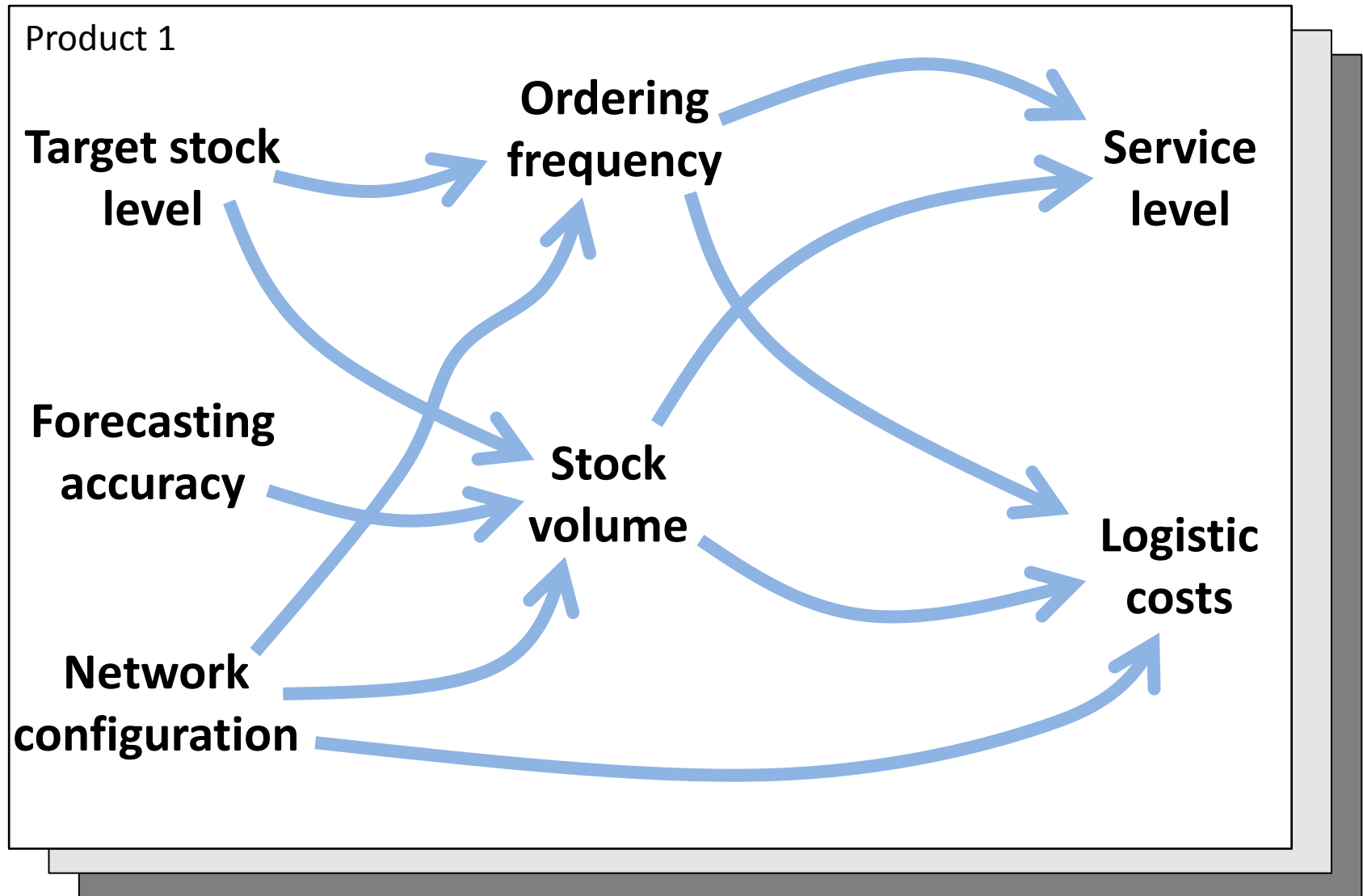
## **Issues & challenges:**

- Increase of logistic costs per unit sold even with growth of sales volume
- Plans of expansion outside European Russia to Urals and Siberia
- Plans of opening a new factory in Russia

## **Consulting project tasks:**

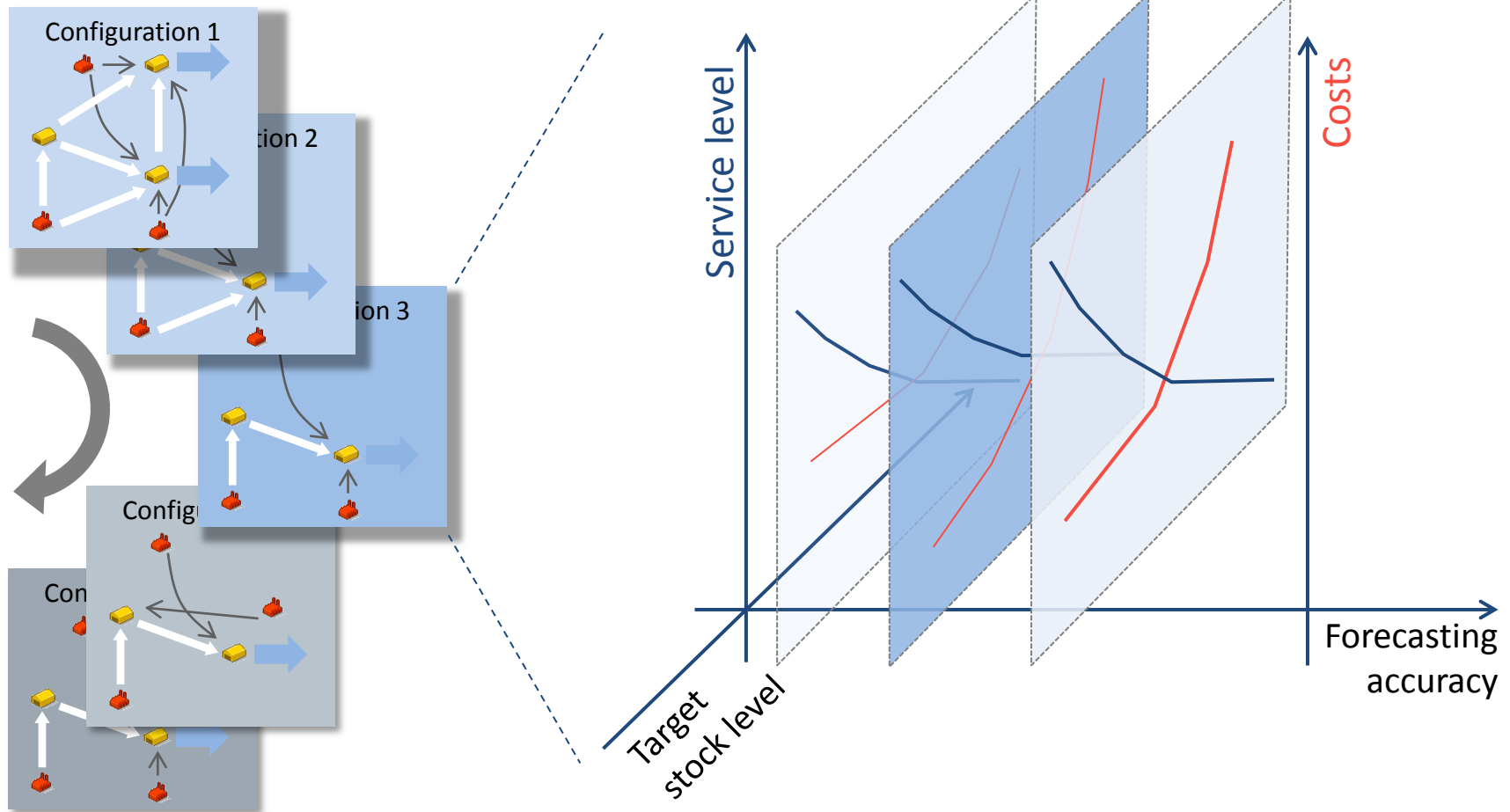
- Show and prove the ways to decrease logistic costs
- Choose logistic network configuration for the expanded client network

# Why simulation

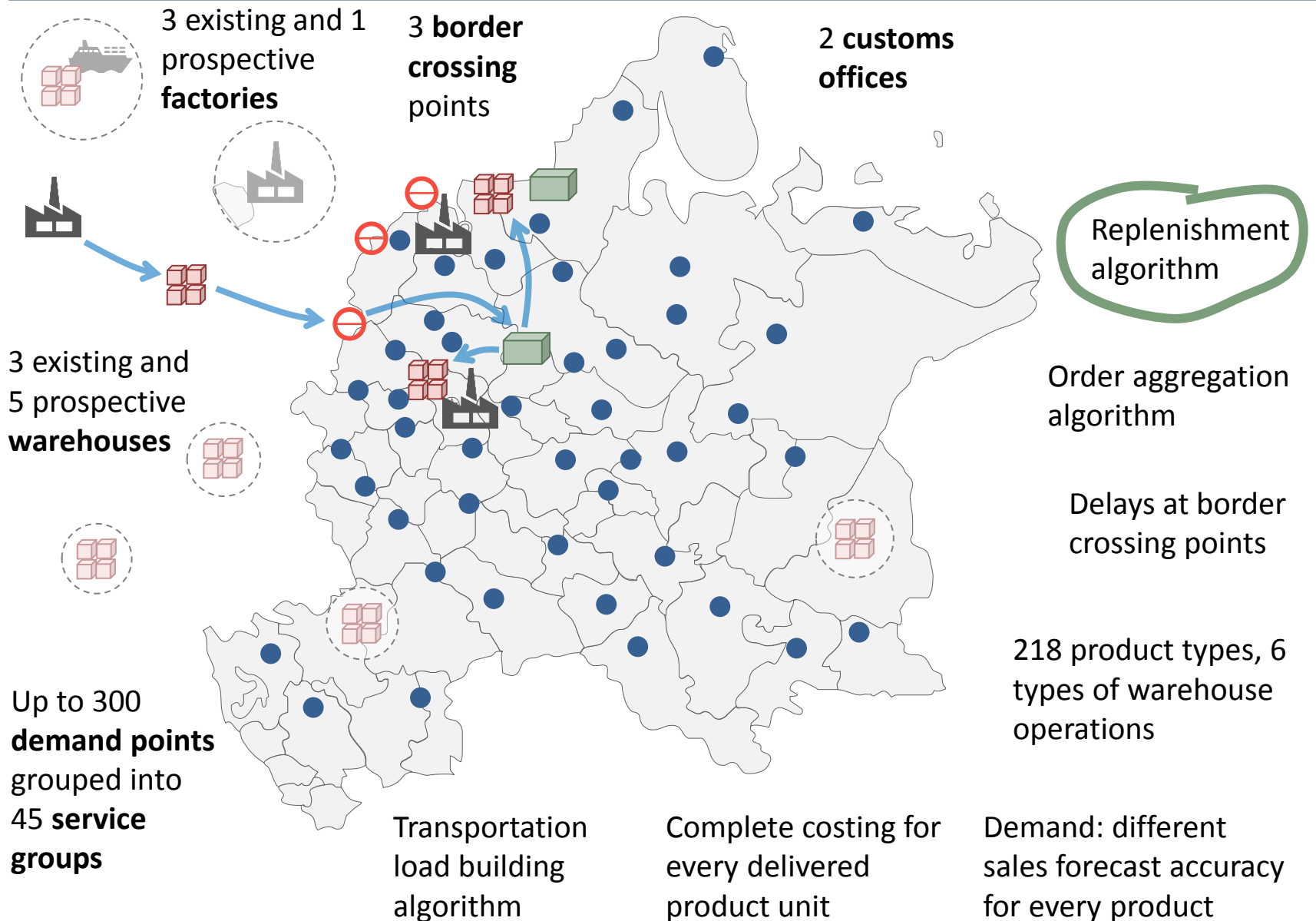


# Simulation task definition

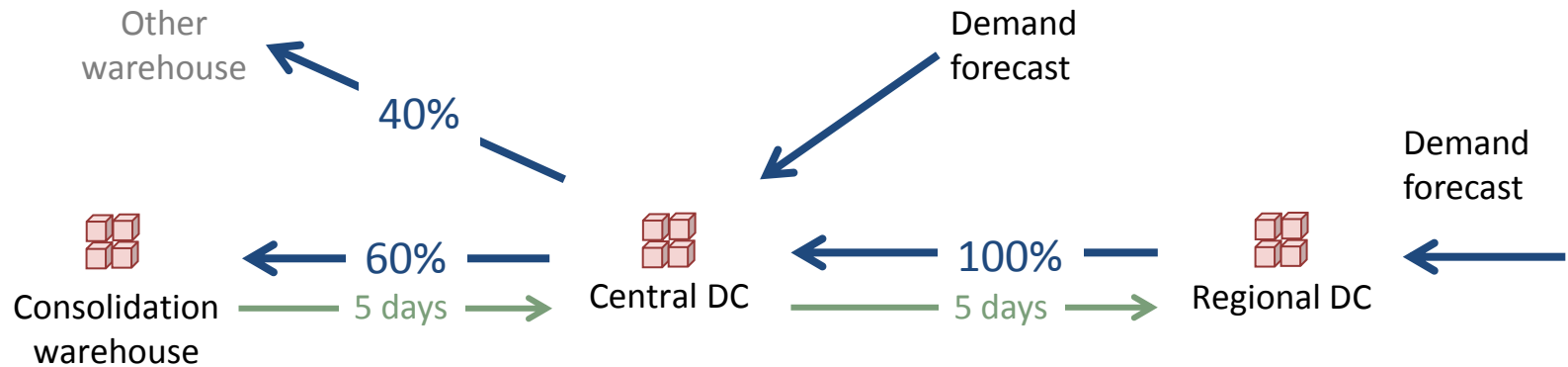
- For every logistic network configuration determine how forecasting accuracy and target stock level influence logistic costs and service level



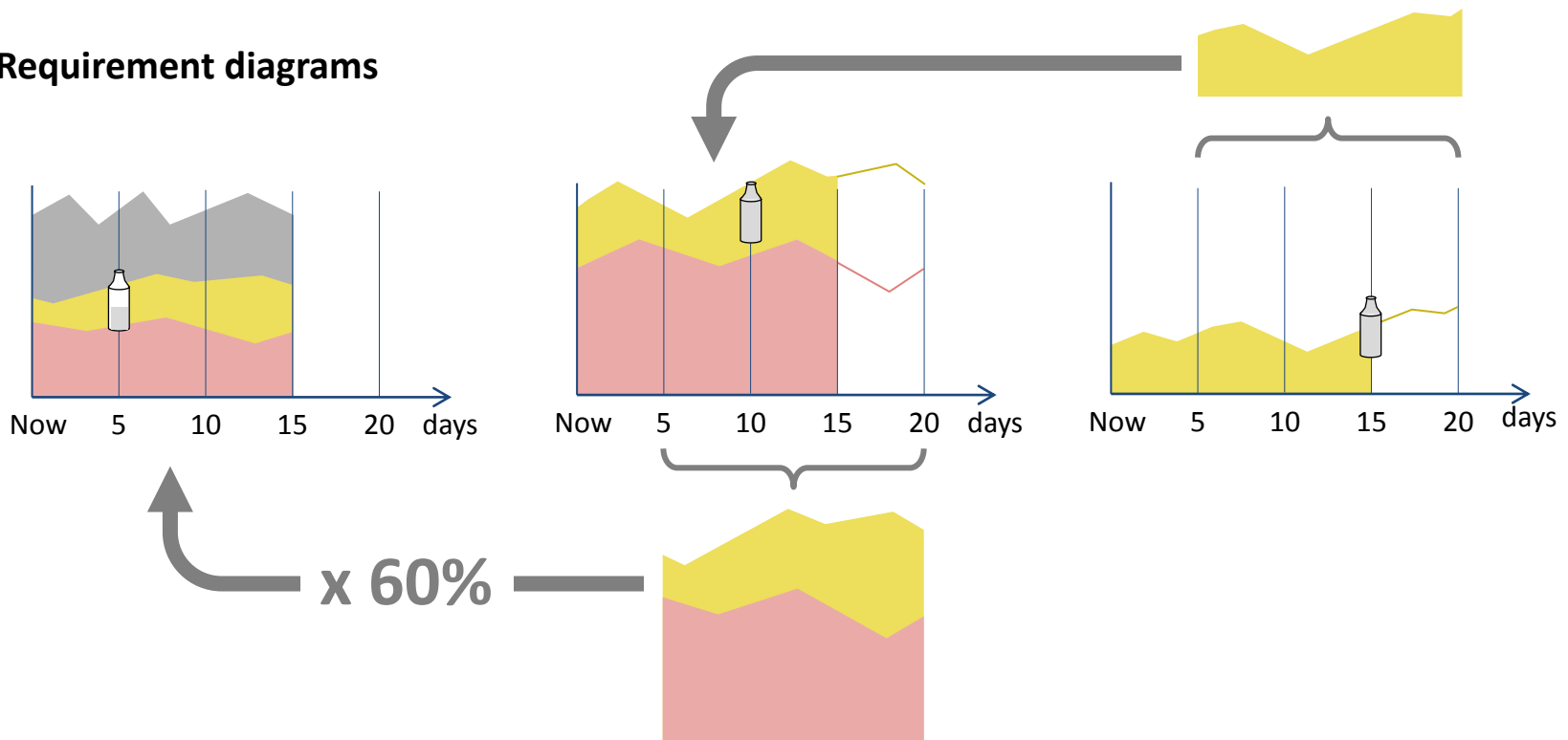
# Supply chain at a glance



# Requirement distribution

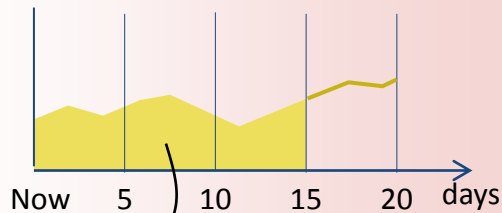


## Requirement diagrams



# Replenishment algorithm

Requirement (demand) diagram

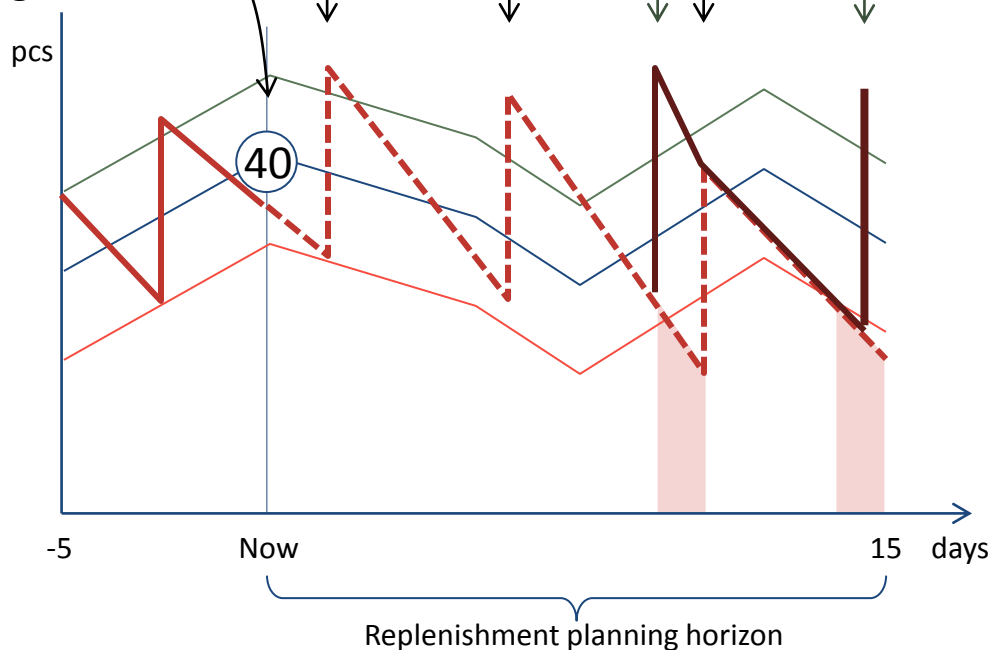


- Requirement
- Current stock
- Expected deliveries
- Replenishment sources
  - Lead time
  - Min order size
  - Proportion

Replenishment algorithm

40 pcs

Stock diagram

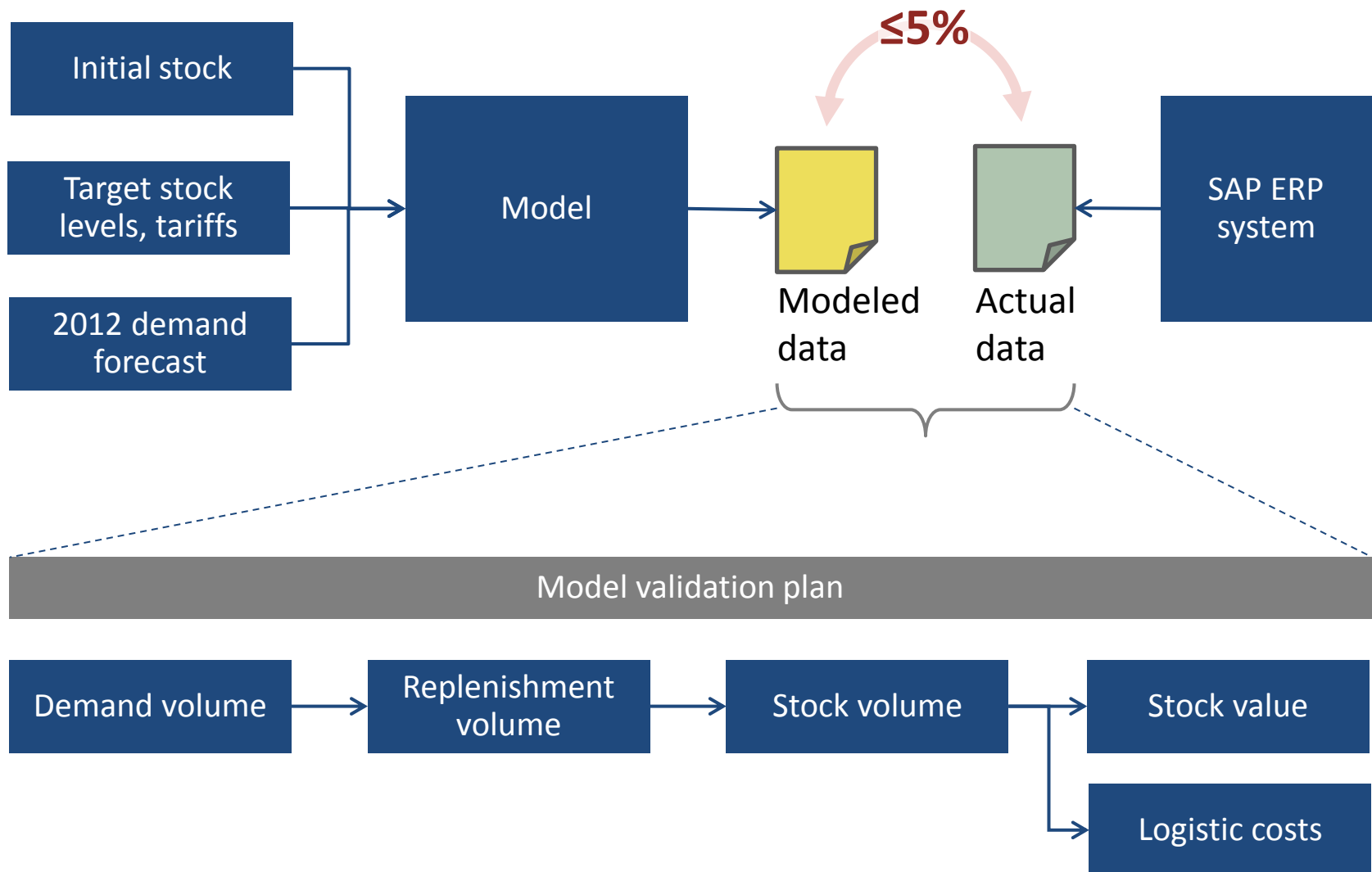


Actions to prevent coverage gaps:

- New orders
- Moving orders earlier / later
- Increase order quantity
- Use emergency replenishment source

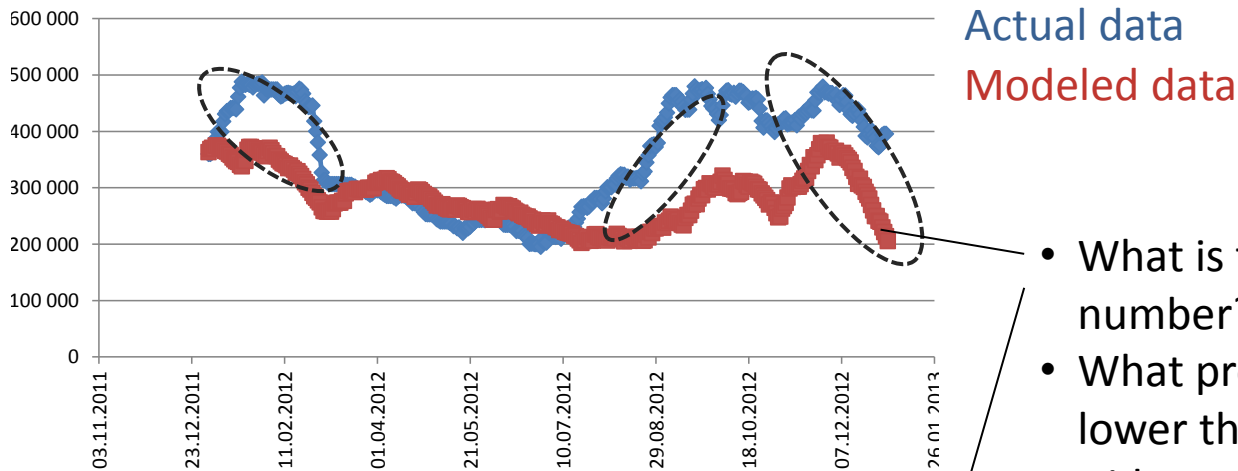


# Model validation

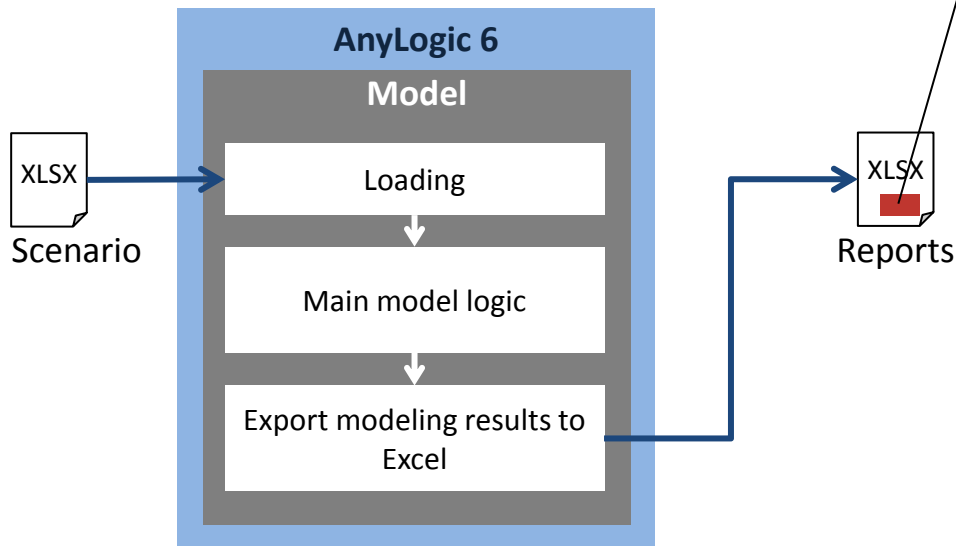


# Obstacle with too much data

## Stock level at Moscow Warehouse

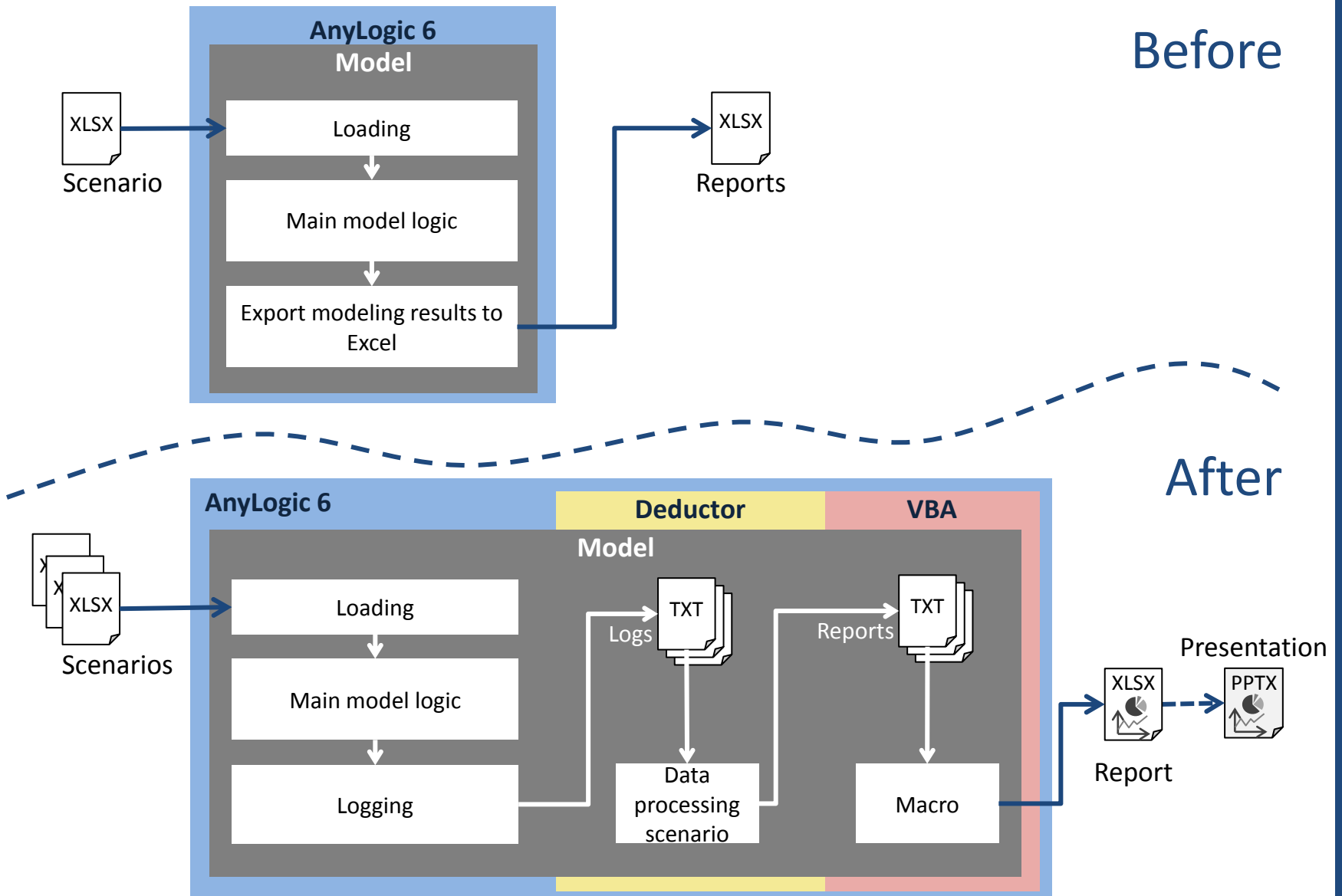


- What is the structure of the number?
- What products have stock lower than actual?
- Did we order less than it was required? Why?

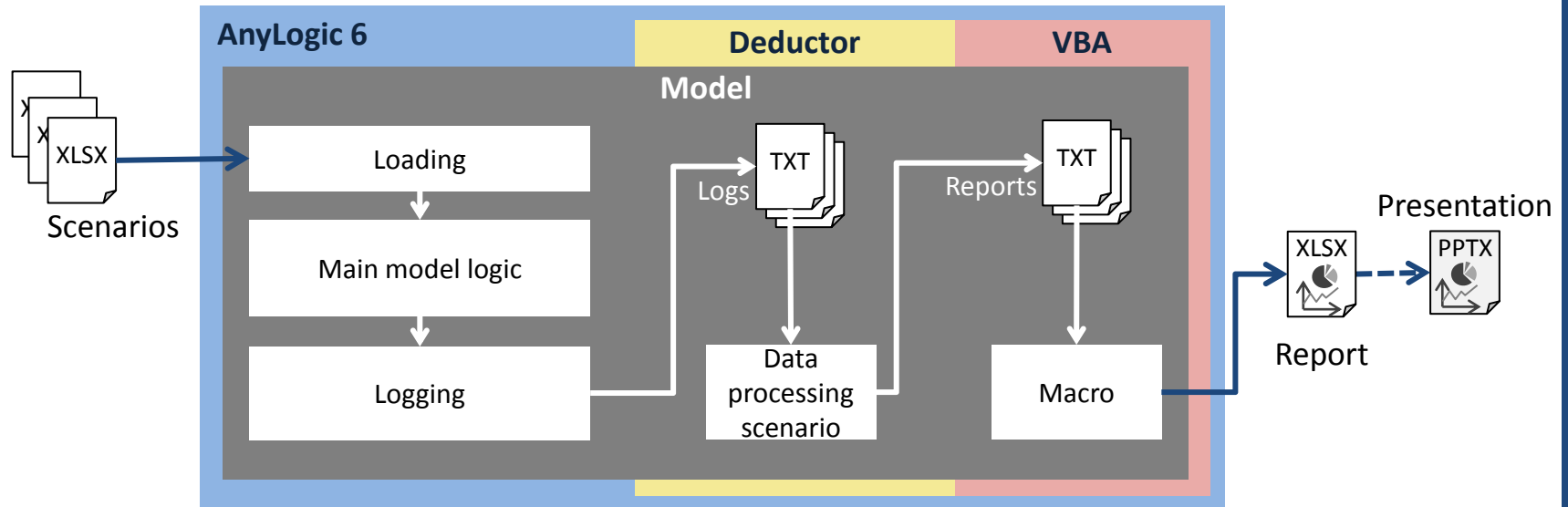


- Re-launch model
- Stop experiment at certain moment
- Look at model state in AnyLogic
- Implement a new report in AnyLogic

# New model structure



# Advantages of the new model structure



Experiment run time decreased 5 times

Up to 3 times less effort to prepare presentation for project team meetings

Modification of reports without editing the model in AnyLogic. Simulation modelers and business consultants can work separately!

- Less time for model validation
- More attention to business consulting
- More supply chain options considered

# Model video

The screenshot shows the DIAGEO simulation applet interface. The main window is titled "Applet Viewer: diageo/Simulation\$Applet.class". The interface includes a toolbar with playback controls and a speed setting of "x50". The DIAGEO logo is visible in the top left, and the LFA logo is in the top right.

The interface is divided into several sections:

- Сценарии (Scenarios):** Contains buttons for "Добавить сценарии..." (Add scenarios...) and "Удалить все сценарии" (Remove all scenarios).
- Запуск модели (Model Start):** Includes a text field for a file path (D:\Модель\Результаты\Result.xlsx) and a "..." button. Below are checkboxes for "Показывать анимацию" (Show animation) and "Открыть файл с результатами" (Open file with results).
- Параметры (Parameters):** Includes a text field for a folder path (D:\Temp\), a text field for an executable file path (C:\Program Files (x86)\BaseC...), and a large orange play button.

An "Открыть" (Open) dialog box is overlaid on the interface, showing a file list in the "Сценарии" (Scenarios) folder:

- 01. Базовый ДП
- 02. Базовый ДП узкий коридор
- 03. Латвия ДП
- 04. Нет СПб ДП
- 05. Финляндия ДП
- 06. Польша ДП
- 07. Ростов + Екат ДП
- 08. Нет Таллина
- 09. Все через Таллин ДП
- 10. Все через Таллин ДП нулевой реворк

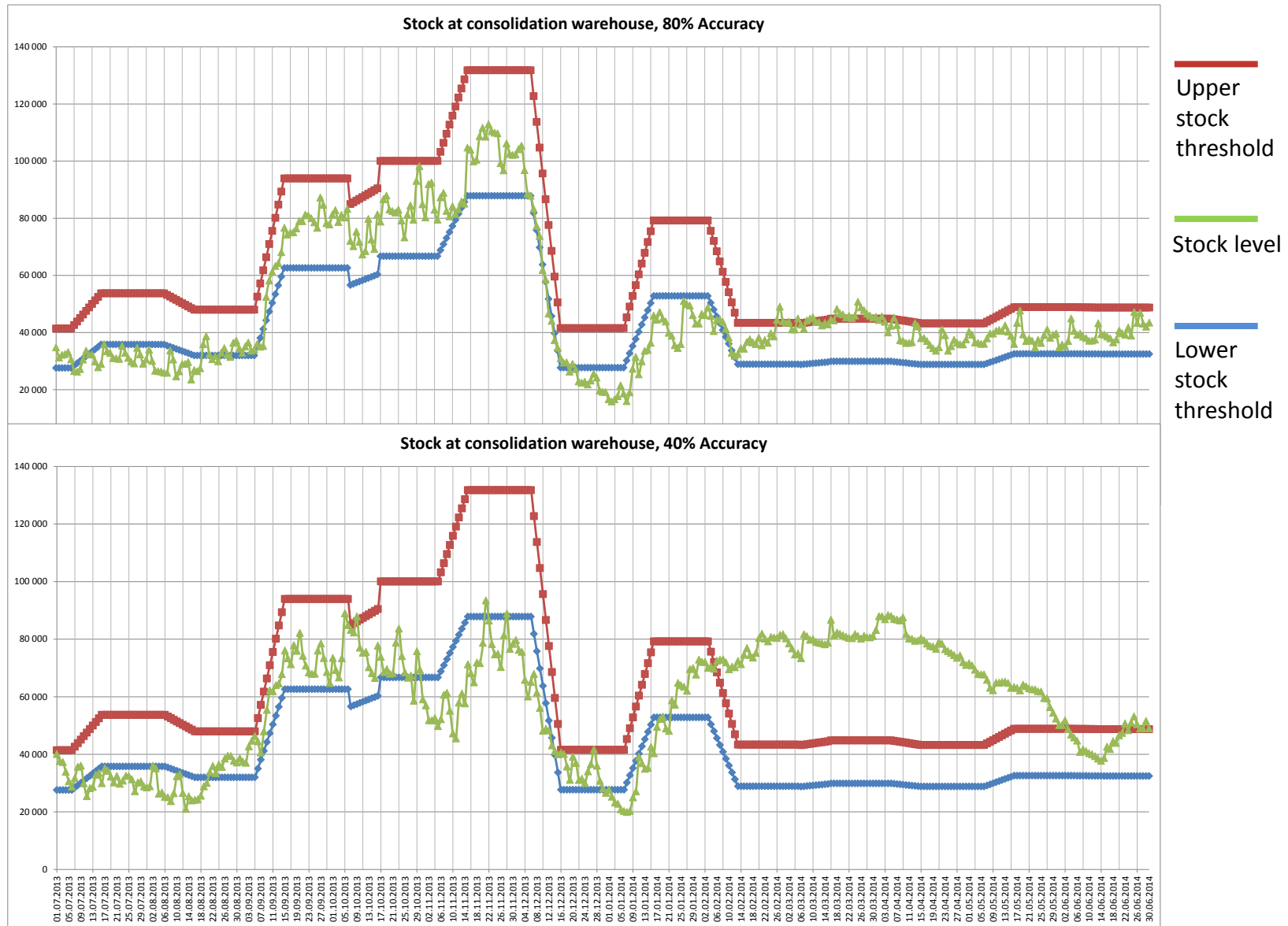
The dialog box also shows the file type set to "Excel files (\*.xls, \*.xlsx)".

At the bottom of the applet window, there is a status bar with the following information:

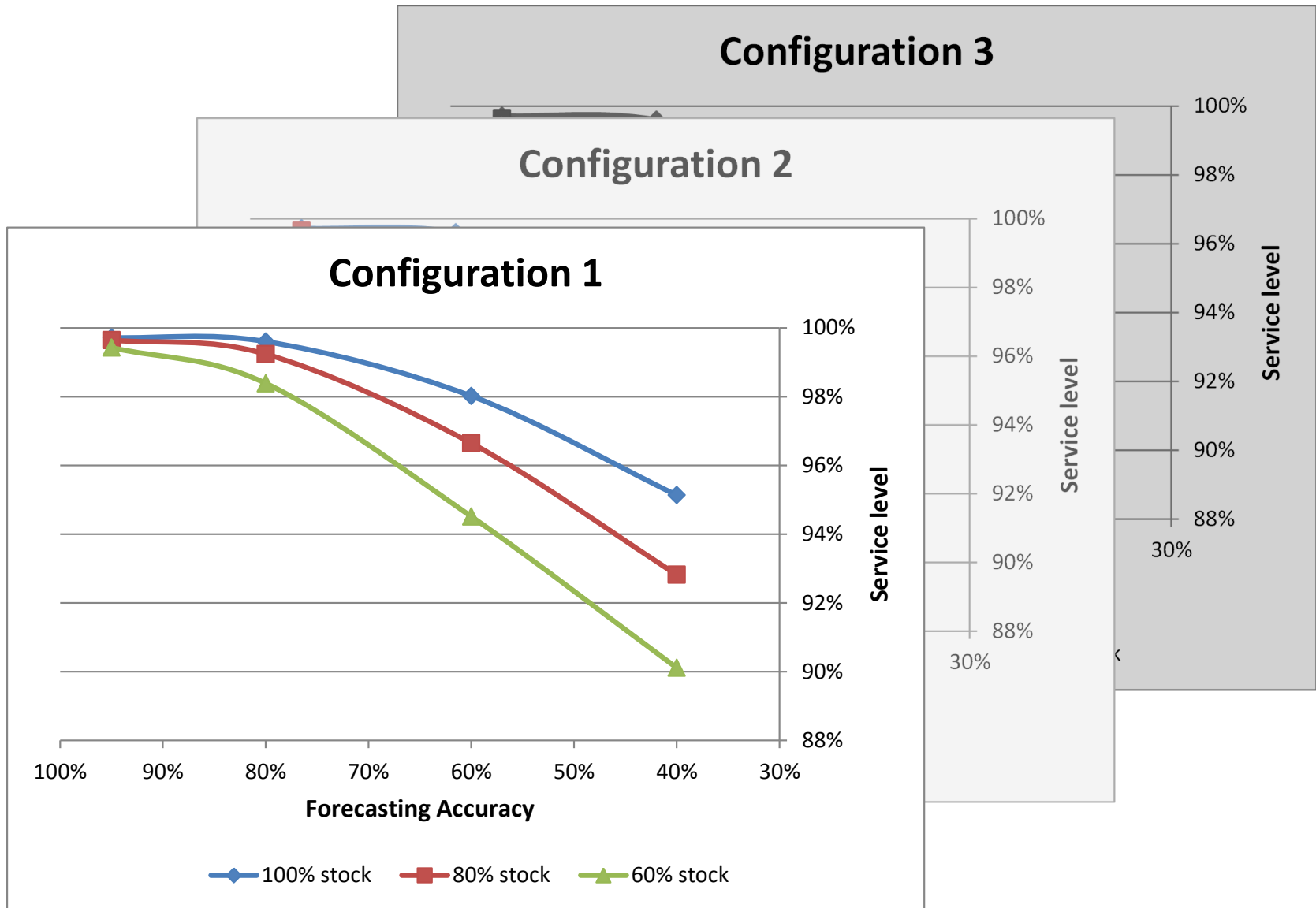
- Прогон: 0 (Simulation: 0)
- Готов (Ready)
- Время: - (Time: -)
- Прогон: Время остановки не задано (Simulation: Stop time not set)
- Дата: - (Date: -)
- Память: 27 (Memory: 27)

The text "Applet started." is visible in the bottom left corner of the applet window.

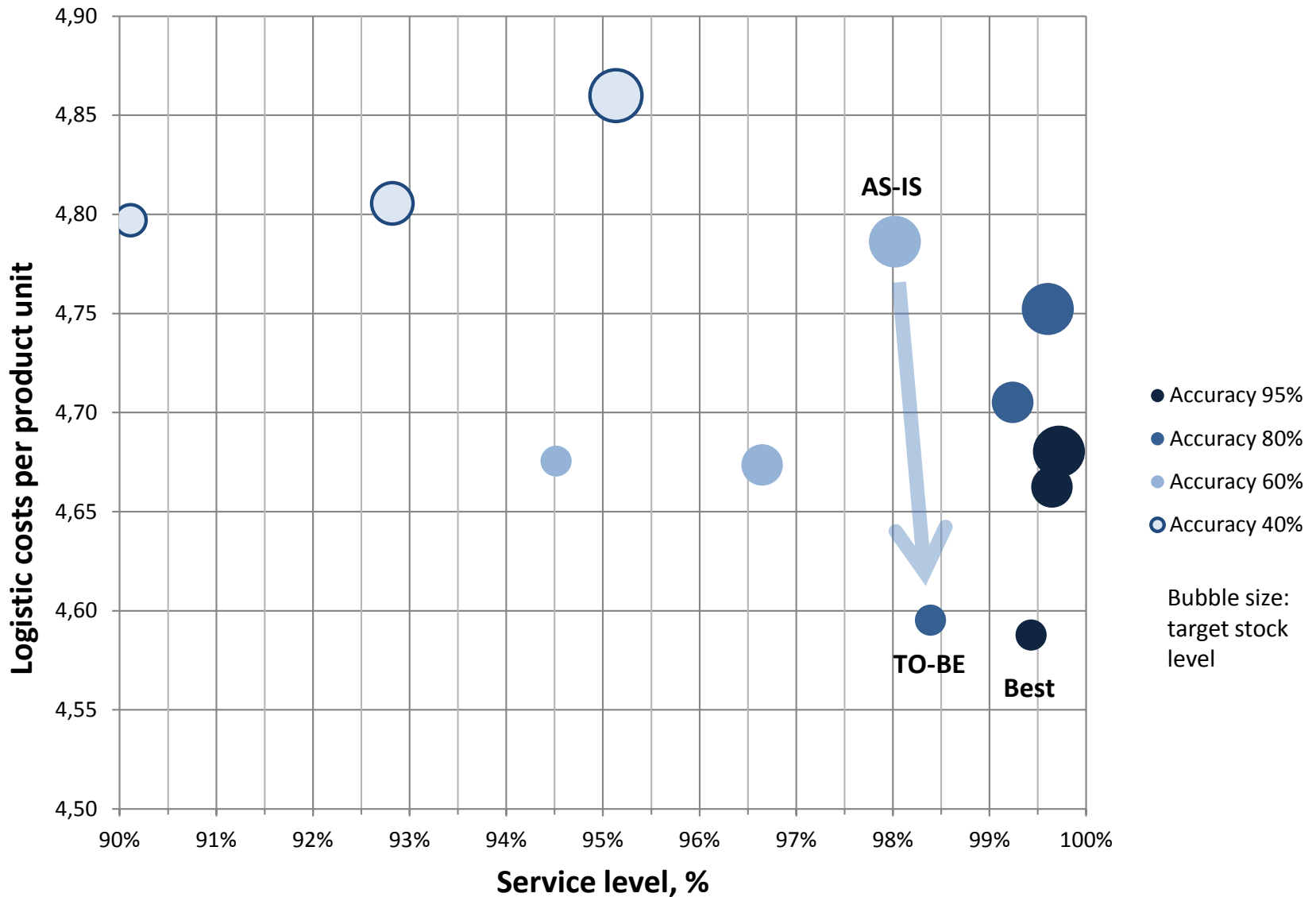
# Stock at different forecasting accuracy



# Service level vs. target stock & accuracy

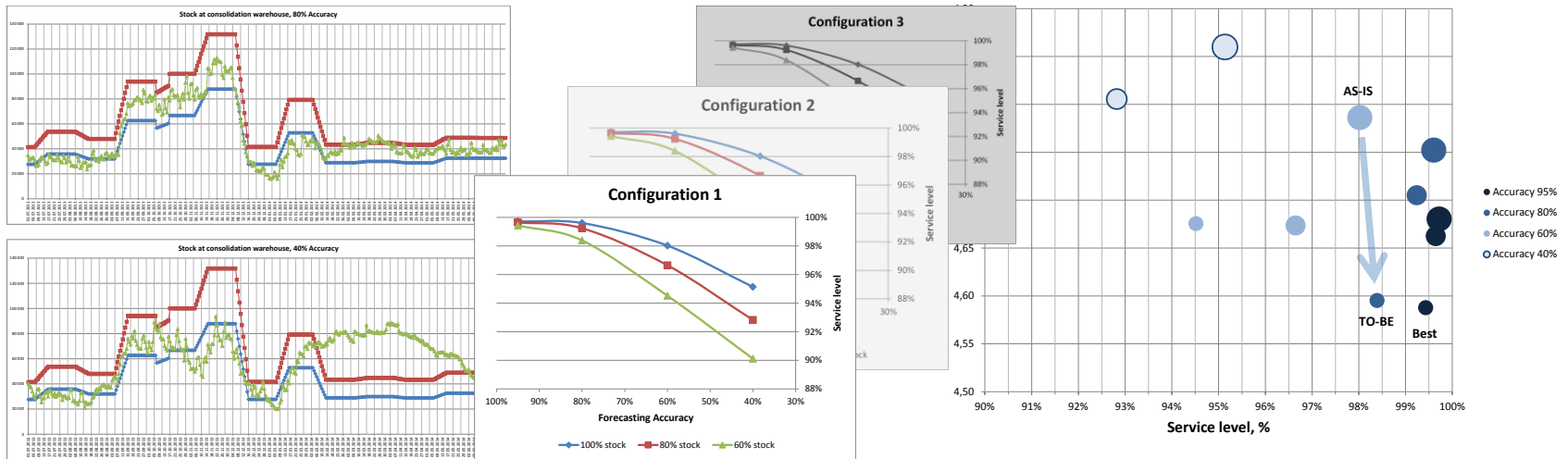


# Consolidation of simulation results





# Business recommendations



- Pay-off period of initiative for increase sales forecasting accuracy from 60% to 80% is less than 2 years
- 20% increase of forecasting accuracy will allow to reduce target stock level by 40% which will reduce logistic costs per unit by 7%
- Opening regional warehouses will require unreasonably big stock to maintain target service level

# Conclusion

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- Experience shows that development of flexible and re-usable models needs coding. Support of using programming is an advantage of AnyLogic
- Model validation and scenario analysis require a lot of effort for data transformation and representation. Adding wider support of data-related operations into simulation tools would increase the efficiency of simulation projects